Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

NOTES AND LITERATURE

THE DEPTHS OF THE OCEAN[1]

THE publication of this work marks an epoch in the advance of the science of oceanography second only to that initiated upon the return of the *Challenger* Expedition, but while the explorations of the *Challenger* were extensive and of necessity somewhat superficial, these later studies conducted by the *Michel Sars* are predominately intensive and thorough.

Not the least valuable of the lessons the book teaches us is the fact that through the skillful and courageous use of a small vessel by trained experts, results of the highest value to science may yet be achieved.

One admires the courage of the leaders of this expedition who ventured to cross and recross the Atlantic in a little steamer only 125 feet in length, and with a coal supply capable of carrying her only 3,400 miles at the economical speed of 9 knots.

The cruise was evidently conducted under the most auspicious conditions respecting its management, the Norwegian government providing the vessel, while Sir John Murray supplied the funds necessary for the expenses of the expedition; and it may be well to recall the fact that the most successful expeditions of the United States Fish Commission steamer *Albatross* were conducted under a somewhat similar arrangement between the late Dr. Alexander Agassiz and the government.

Thus the ripe experience of the veteran leader in this field of research, Sir John Murray, was enlisted to perfect the methods of such active young students of oceanography as Dr. Hjort and his able associates, Professors Koefoed, Gran, and Helland-Hansen, all of whom accompanied the expedition.

The cruise lasted from April until August, 1910, extending from Plymouth to Gibraltar, thence to the Canaries and then to the Azores, from which region a run was made into the Sargasso Sea and on to Newfoundland, and thence to Glasgow and Bergen.

The book before us is, however, far more than an account of this cruise, rich as its results are in achievement in new fields, for it is actually an epitome of all results hitherto attained in oceanography, and is thus comparable with Agassiz's "Three Cruises of the *Blake*" of 1888.

---

[1] A general account of the modern science of oceanography based largely on the scientific researches of the Norwegian steamer *Michel Sars* in the North Atlantic; by Sir John Murray, K.C.B., F.R.S., etc., and Dr. Johan Hjort, Director of Norwegian Fisheries, with contributions from Professor A. Appellöf, Professor H. H. Gran, and Dr. B. Helland-Hansen, xx + 821 pp., 575 figures. Macmillan and Co., Limited, London.

The first thing which strikes one upon reading this account of the cruise of the *Michel Sars,* however, is the enormous advance which has been made since Agassiz wrote his well-known work.

The book is written in that plain, honest English which the readers of Darwin learned to love so well. It is difficult to review because so crowded with facts of the highest interest, and it sparkles with that rare enthusiasm which characterizes the writings of those happy men of science to whom years and knowledge bring no lessening of youth's enthusiasm. At times the language seems quaint, for most of the chapters were written by students to whom English is not a native tongue; but this only adds to the readableness of the book. Indeed, it is a work which people of general culture as well as specialists may read with sustained interest from cover to cover. It is a fitting monument to the life-work of the great "Naturalist of the *Challenger* Expedition," Sir John Murray.

The historical chapter, and that upon the depths of the ocean are by Sir John Murray. Physical oceanography is written by Dr. Helland-Hansen, the phytoplankton by Professor Gran, the bottom fauna by Professor Appellöf, and the narrative, equipment, fishes of the sea bottom, pelagic animals and general biology are by Dr. Hjort, there being ten chapters in the book.

The signal success of this expedition was due to two factors: a corps of able, enthusiastic students already distinguished by high achievement in these studies, and the possession of exceptionally good apparatus provided through the generous support of the Norwegian government and of Sir John Murray.

Thus the ship carried a huge otter trawl, and a Petersen fish trawl, so efficient that in one haul they captured nearly as many individual fishes as the *Challenger* discovered in its twenty-five hauls between 1,500 and 2,000 fathoms. There were also large vertical closing nets 3 meters wide and 9 long, and hauls were at times made with ten nets and trawls out at various depths at one and the same time. The collections were thus exceptionally rich in species, some new and many rare forms such as *Spirula, Melanocetus krechi,* a remarkable genus allied to *Gastrostomus,* new Leptocephali, many larval fishes with telescopic eyes and a specimen of the giant squid.

But the results, important as they may be, will not be chiefly memorable for the new species and interesting forms discovered, for the intensive studies of the physics and chemistry of the sea, and the application of new methods made possible by improved apparatus has led to the dicsovery of certain general laws.

For example, Professor Gran, using a steam centrifuge capable of centrifuging 1,200 c.c. of sea water at a speed of 700–800 revolutions per minute, discovered the unsuspected fact that the smallest pelagic plants, the nannoplankton which pass readily through the meshes of an ordinary silk net, are far more abundant than are the larger forms. He found, also, that pelagic plant life is most abundant at depths of 10–20 meters, but becomes extremely scanty below 100 meters, and he confirms the conclusion of Nathansohn that marine plant-life thrives best where ascending currents bring upward a supply of nitrogenous compounds derived from the decomposition of organic matter in the deep sea. Gran concludes that in the tropics the phytoplankton consists of numerous species, most of which are rare, whereas in the colder waters there are few species but great aggregations of individuals.

Professor Helland-Hansen made use of a new form of photographic-plate photometer which he himself had invented. He was thus enabled to demonstrate that a good deal of sunlight penetrates to a depth of 1,000 meters, but at 1,700 meters his plates were unaffected by an exposure of 2 hours' duration. The sun's rays at a depth of 500 meters in clear tropical water still retain a definite direction, not having yet become diffuse. But the most important discovery is the fact that the red rays are absorbed more quickly than the blue. Thus little or no red light can penetrate into the depths and the dark red color so characteristic of the animals of the deep sea is explained by the fact that, there being no red light where they live, they appear black and are thus rendered invisible.

The ship was well supplied with oceanographic apparatus, having a number of Ekman's current meters, Richter's reversing thermometers, Petterson-Nansen's water bottle and Petterson's insulating deep-sea bottle, enabling one to bring samples of water to the deck and there determine the temperature which the water had when at the bottom of the sea.

The *Michel Sars* is certainly to be congratulated upon the success attending their skillful use of this apparatus. For example, the vessel ventured to anchor in a depth of 400 meters over a hard bottom in the straits of Gibraltar and then to make use of two Ekman current meters, one at a constant depth of 10 meters and the other at various depths down to the bottom. They achieved the first accurate quantitative determinations of the currents ever attained at Gibraltar and found that there is a surface current passing inward from the Atlantic to the Mediterranean, while at the same time a strong bottom-current of dense water passes outward into the Atlantic. The boundary between these two currents is usually at a depth of about 150 fathoms but this is greatly affected by the tidal conditions, for during one hour the current flowed outward toward the Atlantic even at the surface.

Other studies in the open Atlantic far from land enabled them to distinguish currents due to tidal action at the surprising depth of more than 1,000 fathoms. Indeed, a most interesting part of the book is devoted to the discussion of the physics of oceanic and tidal currents, and the expedition has achieved a hopeful purpose if it has done little more than point out the possibilities of research in the complex subject of the relation between tidal waves and tidal currents. The right-handed deviation of moving masses of water in the northern hemisphere due to the earth's rotation is clearly shown as a result of titration to determine the densities of sea water at various depths. Thus it is shown that the dense, relatively warm water of the Mediterranean spreads out in a great wedge in the intermediate depths of the Atlantic, and that most of this water moves northward off the coast of Portugal.

Through studies in density it is shown that the so-called "Gulf Stream" water overlies the cold water of Arctic origin.

But it is impossible to do more than merely indicate a few of the more important facts and laws presented in this remarkable book. In fact it is impossible to review a work which is itself a review of all previous studies as well as a medium for the presentation of newly discovered facts.

An appreciated feature of the book is the numerous charts, maps and hydrographic sections showing density and temperature gradients, the distribution of oxygen in the ocean, and the most recent results of exploration in soundings.

For example, it is shown that in 1910 the temperature at 400 fathoms in a certain place was 5° C. colder than in 1873 when the *Challenger* worked in the same region.

The area of the ocean is stated to be 139,295,000 square miles, of which 58.42 per cent. has a depth of between 2,000–3,000 fathoms, and about one sixth is less than 1,000 fathoms deep.

The hydrographic sections from the Sargasso Sea to Newfoundland, and from Newfoundland to Ireland, as well as the more intensive studies of the Spanish Bay and Gibraltar, and of the Wyville Thomson Ridge between the Faroe and Shetland Islands are especially interesting.

Other charts based upon the researches of Knudsen, Ostenfeld, and Brenneke show the distribution of dissolved oxygen in the Atlantic down to 1,500 fathoms between 60° N. and 50° S. latitude, proving that the higher the salinity and the temperature the less the absorption of oxygen, and hence the relative deficiency of oxygen in the surface waters of the tropics.

In a work of this magnitude there must needs be errors and omissions, but these are so infrequent and of such small moment that it seems ungracious to call attention to a few of the more noticeable. The impalpable chalky deposit found in coral reef regions is still referred to as "coral mud," although in 1910 Vaughan stated that it was a chemical precipitate, and this enabled G. Harold Drew, of Cambridge, to demonstrate that it is actually a precipitate caused by the action of a bacillus in depriving the warm tropical water of its nitrogen, thus enabling the calcium to combine with the dissolved CO_2 to form calcium carbonate.

In the table at the bottom of page 175, the statement "the number of grams of salts per *liter* of sea water" should read "the number of grams of salts per *1,000 grams* of sea water."

On page 187 "*purifying* sarcodic matter" should read "*putrifying* sarcodic matter." But such criticisms are really puerile, and are given chiefly to show the negligible character of the errors in the book, the editorial work upon which reflects great credit upon Messrs. James Chumley and Dr. Caspari.

A happy feature in the editorial arrangement of the book is the system of marginal notes which enable one quickly to discover the subjects of each paragraph. One regrets the absence of a bibliography, but the introduction of such a list would have perhaps too greatly enlarged the size of the book.

Apart from the purely scientific side which we have been considering the book indicates the possible practical value of these studies. For example, it is shown that the growth-rate of pine trees on the coast of Norway bears a direct relation to the temperature of the ocean water, and for six successive years when the amount of heat in the "Gulf Stream water" was great in the month of May the air temperature in Norway was high in the following winter. The water-temperature also bears a direct relation to the time of the blossoming of *Tussilago farfara* at Upsala. Also, Dr. Hjort shows that the southern limit of the valuable boreal food fishes everywhere coincides with the isotherm of 10° C. at a depth of 100 meters.

ALFRED G. MAYER.

THE GROWTH OF GROUPS IN THE ANIMAL KINGDOM

ANY one who makes an intensive study of many representatives of some organism becomes impressed by the fact that they form many slightly differing groups, and is led to ask how these diversities have arisen. This has been the experience of Lloyd[1] in studying the rats of India, in connection with the problem of plague prevention. He has therefore been moved to present in book form his impressions as to how the observed groups probably arise, together with the facts on which these impressions are based; and some general deductions from these impressions.

The facts observed in the study of the rats are of the following character: (1) Small groups of rats differing in some respects from the forms regarded as typical, occur frequently here and there. (2) Such groups, with the same exceptional characters, appear in various widely separated places, showing that the different small groups have arisen independently of each other. (3) "This is true, however, only in the case of groups whose peculiarity appears as a single character unit. Those groups whose peculiarity is made up of several uncorrelated characters arise on one occasion only" (p. 50). Descriptions and figures of many such cases are given; the account here is of much value and interest.

Such facts naturally lead the author to hold that groups of this sort have arisen by mutation: that is, by a dropping out or alteration of single unit characters, in the Mendelian sense; that the same character often drops out in different localities, giving rise to small groups of independent origin, yet having the same distinctive features. This part of the discussion would have been given more precision by consideration of the work on inheritance in rodents and other organisms, as carried on by Castle and others. Further, the pure line work with homozygotes and in vegetative reproduction might give definiteness to many of the author's rather vague views as to the nature of these groups. The conclusions of Lloyd along these lines will appear somewhat halting and loose to persons steeped in the experimental work in

---

[1] "The Growth of Groups in the Animal Kingdom," by R. E. Lloyd, Longmans, Green and Co., 1912, 185 pp., $1.75.